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cc: Leslie

LOW TEMPERATURE-PRESSURE, SEQUENTIAL LEACH-PRECIPITATION OF POLYMETALLIC SEDIMENT HOSTED OR

Sequential leach-precipitation scheme for obtaining a high grade concentrate to sell. The ore deposits are small but, high grade and contain as ore elements: Cu, Mo, Ag and Tl with co products? of Pd, Re, U, Co, Ni, and Zn, with by products-waste products of As, Ba, Sr, Hg, Se and Fe. We blend the ores of different head run grades by crushing and ball milling to 30 mesh minus. We intend to leach the ore minerals in batch tanks with water, weak alkaline and weak acid solutions and precipitate by means of gas, neutralization, distillation, activated carbon, cementation or crystallization which ever is most effective. The ores are well oxidized with sulfide contents less than 3% and are gravity concentrated from ball mill washings.

ORE GRADES: Cu 0.4-!0 %, Mo 0.03- 0.5%, Ag 5g/ton-7oz/ton, Tl 5ppm->500ppm, U 50 ppm- 0.06%, Pd 0-2.5 g/ton, Re 0-1000 ppb, Co 5ppm - 500 ppm, Ni 5ppm-600 ppm, Zn 50 ppm- 1500 ppm, As 50 ppm-4600 ppm, Ba 10 ppm-36%, Sr 50-2000 ppm, Hg 50 ppb-1500 ppb, Se 0-200 ppm, Fe 1-10%, V 20 ppm-2000ppm. High Na contents.

INTENDED LEACHATES: Water for water soluble sulfates (Mo,U etc) → acetic acid for carbonates of Cu, Co, Ni, Zn etc.→ sodium carbonate ± bicarbonate for oxides of Mo → ammonium hydroxide for oxides, hydroxides and chlorides of Cu, Ni, Co, Zn, Cd, Hg, Ag, Pd & Re etc. → sodium hydroxide for various metals left behind and to dissolve pH sensitive hydrocarbons → sulfuric acid to leach Tl and residuals. 24-48 hrs each leach. Each leachate produces a distinctive color with a corresponding change in pH, therefore completed leaching with one leachate will be indicated by pH and lack of leach solution color.

SOLUTION pH RANGES: Acids pH 6-5. Bases pH 8-9. Sodium hydroxide pH 8-12.

PRECIPITANTS INTENDED/INVESTIGATED: Hydrogen, hydrogen sulfide, carbon monoxide, carbon dioxide or methane gases. Alkali/acid neutralization processes. Activated carbon columns. Crystallization columns. Distillation/evaporation columns.

GAS KILL TANKS: Excess gases used in precipitation and leaching after passing through a precipitation tank will then pass to a kill tank where it is either neutralized or another gas is produced. Carbon dioxide is produced from acetic acid generation, and is used after the water leach to leach U, excess gas then passes to a precipitation tank and then to a lime water tank or sodium hydroxide holding tank where it is used to make calcium and or sodium carbonates respectively.

ORE MINERAL RADICALS: Sulfate, carbonate, chloride, ammines, sulfide, oxide, silicate, arsenate and hydrocarbon.

POSSIBLE RESORPTION: Clays (slimes are generated after each leach and are high in metal values), oxides of Mn and Fe, hydrocarbons and bitumen's.

TEMPERATURE AND PRESSURE RANGES OF OPERATION: T 0-100 F. P atmospheric to 150 psi.

FILTERING: Self filtering in leach tanks, with clear effluent siphoned and passed through secondary filter to precipitation tanks.

WATER PURIFICATION: Water will pass through cementation filters of Zinc → Aluminum → pyrite → calcite → zeolite → activated carbon by means of a cementation filter and return to holding tanks.

ORE MINERALS:
Copper: sulfate, carbonate, oxide, chloride and sulfide.
Molybdenum: Sulfate, oxide and sulfide.
Silver: Sulfate, chloride.
Thallium: Sulfate, oxide, sulfide, carbonate, chloride?
Palladium: Native, oxide, chloride, sulfate?
Rhenium: Sulfide, sulfate? Oxide? Native?
Cobalt: Sulfate, carbonate, chloride, oxide.
Nickel: Sulfate, chloride, oxide, carbonate.
Uranium: Sulfate, oxide, carbonate.
Vanadium: Sulfate, oxide, carbonate.
Mercury: Sulfate, chloride, oxide.
Selenium: Sulfate, chloride, oxide, carbonate.
Zinc: Sulfate, carbonate, oxide, chloride.
Cadmium: Sulfate, carbonate, oxide, chloride.
Arsenic: Sulfate, arsenide, sulfide, oxide, carbonate, chloride.

TESTING OUTLINE:

1- Sample, crush, grind and blend head run ore.
2- Assay head run ore.
3- Take splits of blended ore for independent leach testing, e.g. leach with water-acetic acid-sodium carbonate-ammonium hydroxide-sodium hydroxide-sulfuric acid finish.
4- Assay each leach split and remaining pulp.
5- Run progressive leach process and sample leachate and pulp.
6- Run precipitation circuit with various precipitants. Follow with neutralization precipitation.
7- Run neutralized water through sequential cementation filter system.
8- Assay precipitation products.

LEACH TANKS: Leaching tanks are of steel construction and on wheels with bottom dumps for leached pulp extraction. The tanks are loaded from the top with ore and leach solutions added from the bottom. After leaching, the effluent is withdrawn from the bottom and pulp washed with a water and filtered. Pulp will be agitated via compressed

air. Tanks will have triple coat of a special urethane paint TS-66, which is highly resistant to acid solutions to 20% as well as alkaline solutions to 20% and is highly resistant to abrasion, and is resistant to a temperature of 500 °F. Our leach solutions will be no higher than 2.5% of either acid or alkali.

PRECIPITATION-BATCH TANKS: Precipitation tanks will be of steel construction and the inner tank painted with TS-66. The precipitation and batch tanks will be made from 14" to 24" oilfield casing with bolt on top rings. The tanks will be used for making batch chemicals such as acetic acid and for gas precipitation and can withstand pressures > 200 psi and temperatures to 500 °F. Tanks will be fitted with appropriate high pressure valves and double pop offs set at 150 psi. Acids are stored in aluminum tanks.

EXAMPLE OF BATCH AND PRECIPITATION TANK SETUP: Leach liquor will be siphoned from leach tanks and pass through precipitation tank no.1 Hydrogen sulfide gas from batch tank no. 1 will be injected into precipitation tank no.1 to precipitate metallic sulfides. Hydrogen sulfide gas is generated in batch tank no.1 by contacting iron pyrite with sulfuric acid, yielding ferric sulfate and hydrogen sulfide. Hydrogen sulfide then is injected into precipitation tank no 1 and the ferric sulfate and any free sulfuric acid is drained and stored for later use.

Excess hydrogen sulfide from precipitation tank no.1 passes to batch tank no. 2 which contains iron filings. The hydrogen sulfide gas reacts with the iron to produce ferrous sulfide and hydrogen gas. Hydrogen gas is injected into precipitation tank no 2 to precipitate metals in solution to either free metal or respective oxides and hydroxides.

Excess hydrogen gas passes from precipitation tank no.2 through a hot Zn/C chamber where it is combined with excess carbon dioxide from acetic acid production or other operations. Carbon dioxide as it is passed through the hot Zn/C catalysts loses an oxygen atom and combines with the hydrogen to form methanol. Methanol may be used as fuel, sold as is or combined with acetobacter bacteria with air agitation to produce acetic acid.

EVAPORATION/DISTILLATION/CRYSTALLIZATION COLUMNS: Evaporation and or distillation and or crystallization columns for the precipitation of ore elements and reclaiming of leachate chemicals such as ammonia from ammonium hydroxide will be incorporated in the precipitation circuit. Chemical precipitates/gases/liquids will include sodium sulfate, sodium carbonate, ammonia, water, sodium hydroxide, carbon dioxide and other reagents.